BERRY ELECTRONICS INC.

210 VF TEST SET

Operator's Manual

To apply a quiet termination to a 2W circuit, the following switch positions must be used:

Select - Quiet term 28
Select - 2W 2
Select - Hold measure 23
Select - REV 21
Select - Term 13
Select - the termination of choice.....15

NOTE: The unit can be powered or in an OFF position.

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The *210 Test Set* is a portable, battery operated, voice frequency test set for use in troubleshooting and maintaining telecommunications equipment. It provides calibrated test signals while simultaneously making frequency and level measurements on voice frequency systems. Among the features included in the test set are input impedances of 600Ω, 900Ω, 1200Ω, dual electronic hold circuits, choice of four noise weighting filters, full duplex operation, automatic send frequency sweep and simultaneous digital read out of both send and receive level and frequency.

SPECIFICATIONS

GENERAL

Configuration	Full duplex send & receive
Measurements	Level (dBm) Noise (dBrn) Frequency (Hz)
Monitor	Speaker, send and receive with volume control and off
Dial/Hold	Full 2W/4W capability with dual electronic hold
Input/Output	310 Jacks and 5 Way Binding Posts with normal and reversing switch
Impedance	Separate transmit and receive impedance controls
Power	Rechargeable Ni-Cad batteries with Low Batt indicator and automatic shut off

TRANSMITTER

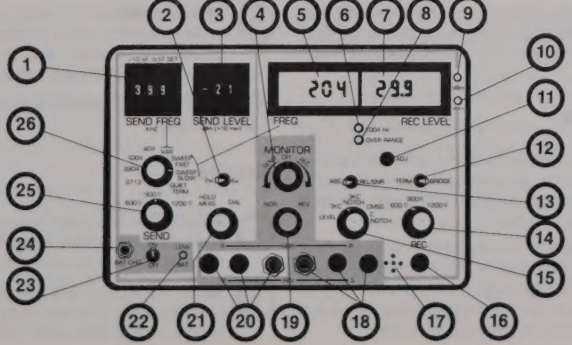
Level	−49.9dBm to +10dBm in 1dB steps
Frequency	200Hz to 4KHz; (usable 20Hz to 4.99 KHz)
Modes	Manual: 10Hz Steps (4Hz offset) Fixed Freq: 404, 1004, 2804, 2713Hz Sweep: 2 Speeds, 100Hz steps with S.F. Skip Quiet Termination
Accuracy	Frequency: ±1Hz Level: 1dB Steps ±.05dB/dB 10dB Steps ±.5dB Max.
Impedance	600, 900, 1200 Ohms

RECEIVER

Frequency Measurement Range	200Hz to 4KHz
Level	+10dBm to −40dBm
Accuracy	±2 counts
Resolution	1Hz
Level Measurement	
Frequency Range	200Hz to 4KHz
Measurement Range	+10dBm to −40dBm, full auto ranging
Accuracy after	±0.1dB at 1000Hz for levels between 0 and −19dBm ±0.2dB all other levels
Resolution	0.1dB
Relative Level Measurement	+10 to −30dB adjust range
S/N Measurement	20 to 50dB Range
Noise Measurement	
Weighting	C Message, C Notch 3KHz Flat, 3KHz Notch
Measurement Range	30 to 70dBrn
Accuracy	±1dB
Resolution	0.1dB
Input/Output	
Controls	Separate impedance controls for send/receive
Impedance	600, 900, 1200 ohms and bridged (Balanced)

RECEIVER (cont'd)

Line Hold	Dual electronic
LED indicators	Holding tone present, overrange, dBm, dBrn
Environment	
Case	Weather-proof, coated aluminum with removable cover and carrying strap
Cables	Stored in cover
Size	6" X 9" X 4" with cover
Operating Temperature	0°C to 50°C
Input Circuit Protection	DC & Transient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SEND FREQ
SEND LEVEL
FREQ
REC LEVEL
MONITOR
SEND
REC
OVER RANGE

CONTROLS AND INDICATORS (cont'd)

This section contains a description of each of the switches, knobs, jacks, displays and monitor found on the Model 210 Test Set front panel. Refer to Figure 1 for the location of items discussed.

Toggle Switches

(2) **2W/4W**—In the *4W* position, both the send and receive line interface jack fields are connected to the Test Set. When *2W* is selected, only the blue color coded jack field is connected to the Test Set.

(12) **TERM/BRIDGED**—When in the *TERM* position, the receive input is terminated in the impedance selected by the *REC* 600Ω/900Ω/1200Ω knob. In the *BRIDGE* position, the 210 Test Set is connected directly across the receive line without a terminating resistor.

(13) **ABS-REL/SNR**—In the *ABS* position, the absolute value of the received signal is displayed in the *RECEIVE LEVEL* display. The *REL/SNR* position allows the displayed value to be offset by an amount controlled by the *ADJ* knob.

(23) **ON/OFF**—The *ON/OFF* switch controls power to the 210 Test Set.

Knobs

(4) **MONITOR**—This knob selects monitoring of either the send output or receive input of the Test Set on the built-in speaker, as well as controlling the speaker volume.

(11) **ADJ**—The *ADJ* knob is used to offset (add to or subtract from) the value displayed in the *REC LEVEL* display. This knob is used when making relative or *SNR* measurements.

Knobs (cont'd)

(14) **REC 600Ω/900Ω/1200Ω—**This control is used to select the terminating impedance placed across the receive line when the *TERM/BRIDGE* switch is in the *TERM* position

(15) **REC FUNCTION SWITCH—**This switch selects the type of measurement, *LEVEL* or *NOISE*, to be made by the 210 Test Set. When noise measurements are made, the switch selects the type of weighting filter to be used—3KC flat, 3KC flat with 1004Hz notch, C-message or C-message with 1004Hz notch.

(19) **NOR/REV—**In the *NOR* position the blue color coded jack field is the send jack field and the red color coded jack field is the receive jack field. When set to the *REV* position, the functions of the jack fields are reversed.

(21) **HOLD MEAS/DIAL—**In the *DIAL* position, the send jack field is disconnected from the test set generator and the send side electronic hold circuit. In the *HOLD MEAS* position, the send jack field is connected to the test set generator and the send side electronic hold circuit.

(25) **SEND 600Ω/900Ω/1200Ω—**This control is used to select the output impedance of the send generator.

(26) **SEND FUNCTION SWITCH—**This switch selects one of four fixed commonly used send frequencies (404, 1004, 2804 or 2713Hz), *VAR* output frequency (set by the *SEND FREQ* thumb wheel switch), *FAST* or *SLOW* 100Hz step sweep or a Quiet Termination at the 210 Test Set send output.

CONTROLS AND INDICATORS (cont'd)

Thumb Wheel Switches

(1) **SEND FREQ**—This switch is used to set the send frequency of the 210 Test Set when the *SEND FUNCTION SWITCH* is in the *VAR* position. The frequency is set in either 10Hz, 100Hz or 1KHz steps with a built-in 4Hz frequency offset.

(3) **SEND LEVEL**—This switch is used to set the send level of the 210 Test Set. The switch is calibrated in dBm and can be set in 1dB increments.

Displays and Indicators

(5) **FREQ**—Displays the 210 Test Set received frequency in hertz when the *REC FUNCTION* switch is in the *LEVEL* position. If the *SEND FUNCTION* switch is set to *SWEEP FAST* or *SLOW*, the 210 Test Set send frequency is displayed regardless of the setting of the *REC FUNCTION* switch.

(6) **1004Hz**—This indicator will light when a valid holding tone is present at the receive input of the 210 Test Set.

(7) **REC LEVEL**—Displays the result of receive level (dBm) or noise (dBrn) measurements made by the 210 Test Set.

(8) **OVER RANGE**—This indicator will light whenever the received level or noise input exceeds the measurement range of the test set.

(9) **dBm**—The dBm indicator will light when the *REC LEVEL* display is calibrated in dBm.

(10) **dBrn**—The dBrn indicator will light when the *REC LEVEL* display is calibrated in dBrn.

(22) **LOW BAT**—This indicator will light when the rechargeable batteries of the Test Set have discharged to the point where approximately 45 minutes of test set operation remains.

Jacks and Speaker

16 **GROUND POST**—This binding post is used to connect the test set chassis to earth ground when desired.

17 **SPEAKER**—Used to present the Test Set operator with an audible indication of "hits," or the signal present at the Test Set receive or send terminals.

18 **RED JACK FIELD**—The 5-way binding posts and 310 jack serve as the Test Set receive inputs when the *NOR/REV* switch is in the *NOR* position and as the send outputs when the *NOR/REV* switch is in the *REV* position. The sleeve of the 310 jack is connected to chassis ground

20 **BLUE JACK FIELD**—The 5-way binding posts and 310 jack serve as the Test Set send outputs when the *NOR/REV* switch is in the *NOR* position and as the receive outputs when the *NOR/REV* switch is in the *REV* position. The sleeve of the 310 jack is connected to chassis ground

24 **BAT CHG**—This connector is used to connect the supplied external battery charger to the 210 Test Set

Line Interface

This section describes the line interface connections required to perform the measurements described in subsequent sections of this manual.

2-WIRE LINE INTERFACE

To interface to a 2-wire line, proceed as follows

1. Set the *2W/4W* switch to the *2W* position and the *HOLD/MEAS DIAL* switch to the *HOLD MEAS* position
2. Set the *SEND* and *REC 600Ω/900Ω/1200Ω* switches to match the line impedance. Set the receiver *TERM/BRIDGE* switch to the desired position
3. Connect the line under test to the blue color coded 310 jack or 5-way binding posts
4. Set the *NOR/REV* switch to *NOR* in order to send, or to *REV* in order to receive.

4-WIRE LINE INTERFACE

To interface to a 4-wire line, proceed as follows

1. Set the *2W-4W* switch to the *4W* position and the *HOLD MEAS/DIAL* switch to the *HOLD MEAS* position
2. Set the *SEND* and *REC 600Ω/900Ω/1200Ω* switches to match the line impedance. Set the receiver *TERM/BRIDGE* switch to the desired position
3. Set the *NOR/REV* switch to *NOR*
4. Connect the send line to the blue color coded 310 jack or 5-way binding posts.
5. Connect the receive line to the red color coded 310 jack or 5-way binding posts.

Line Interface (cont'd)

2-WIRE DIAL-UP

To dial-up and then hold a single 2-wire wet line, proceed as follows:

1. Set the *2W/4W* switch to the *2W* position and the *HOLD MEAS/DIAL* switch to the *DIAL* position.
2. Set the *SEND* and *REC 600Ω/900Ω/1200Ω* switches to match the line impedance. Set the receiver *TERM/BRIDGE* switch to the desired position.
3. Set the *NOR/REV* switch to *NOR*.
4. Connect a lineman's handset and the 2-wire line to the blue color coded 310 jack or 5-way binding posts.
5. Depress the off-hook button or turn on the off-hook switch on the lineman's hand set.
6. Listen for a dial tone from the handset, then dial the desired number.
7. When the call is answered, set the *HOLD MEAS/DIAL* switch to the *HOLD MEAS* position.
8. Set the *NOR/REV* switch to *NOR* in order to send or to *REV* in order to receive.

Line Interface (cont'd)

DOUBLE 2-WIRE DIAL-UP

To dial-up and then hold two separate 2-wire wet lines, proceed as follows:

1. Perform the first two steps outlined under **2-Wire Dial-Up.**
2. Set the *NOR/REV* switch to *REV*
3. Connect a lineman's handset and the first 2-wire line to the red color coded 310 jack or 5-way binding posts
4. Depress the off-hook button or turn on the off-hook switch on the lineman's hand set.
5. Listen for a dial tone from the handset, then dial the desired number.
6. When the call is answered, set the *NOR/REV* switch to the *NOR* position
7. Disconnect the lineman's handset from the red color coded terminals and connect the handset and the second 2-wire line to the blue color coded 310 jack or 5-way binding posts.
8. Repeat steps four and five.
9. When the call is answered, set the *HOLD MEAS/DIAL* switch to the *HOLD MEAS* position
10. Both lines are now independently held and, the 210 Test Set will receive on the first line and send on the second If the user wishes, the *NOR/REV* switch can be used to exchange the *SEND/RECEIVE* function of each line without dropping the lines.

Receive Measurements

This section describes the operating procedures for the 210 Test Set when making receive measurements

LEVEL AND FREQUENCY

To perform a receive level and frequency measurement, proceed as follows:

1. Perform the required steps in the *LINE INTERFACE* section
2. Set the Receive Function selector switch to *LEVEL* and the *ABS-REL/SNR* switch to *ABS*
3. The *REC LEVEL* display will indicate the receive level in dBm
4. The *FREQ* display will indicate the receive frequency in hertz CAUTION If the Send Function selector switch is in *SWEEP FAST* or *SWEEP SLOW*, the *FREQ* display will indicate the output generator's frequency rather than the receive frequency.

NOISE MEASUREMENTS

To perform a receive noise measurement, proceed as follows:

1. Perform the required steps in the *LINE INTERFACE* section.
2. Set the Receive Function selector switch to the desired noise measurement.
   3KC—3KC flat filter without tone
   3KC NOTCH—3KC flat filter with tone
   CMSG—C-message filter without tone
   C NOTCH—C-message filter with tone
3. The *REC LEVEL* display will indicate the noise level in dBrn
4. The *FREQ* display will blank during noise measurements CAUTION If the Send Function selector switch is in *SWEEP FAST* or *SWEEP SLOW*, the *FREQ* display will not blank but rather it will indicate the output generator's frequency.

Receive Measurements (cont'd)

SNR MEASUREMENTS

To perform a receive *SNR* measurement on a 1004Hz tone, proceed as follows:

1. Perform the required steps in the *LINE INTERFACE SECTION*.
2. Set the *ABS-REL/SNR* switch to the *REL/SNR* position.
3. Set the Receive Function selector switch to *LEVEL*
4. Use the *ADJ* knob to set the *REC LEVEL* display to 00.0
5. Move the Receive Function selector switch to the *3KC NOTCH* position.
6. The *REC LEVEL* display will now indicate the *SNR* of the received 1004Hz tone.

RELATIVE MEASUREMENTS

The relative measurement feature of the 210 Test Set allows the user to make level measurements in terms of plus or minus dBm from a known or starting level. To perform relative level measurements, proceed as follows

1. Perform the required steps in the *LINE INTERFACE SECTION*.
2. Set the *ABS-REL/SNR* switch to the *REL/SNR* position
3. Set the Receive Function selector switch to *LEVEL*
4. Apply the known or starting *LEVEL/FREQUENCY* to the test set.
5. Use the *ADJ* knob to set the *REC LEVEL* display to 00.0 dBm.
6. The *REC LEVEL* display will now display the level of received signals in plus or minus dBm from the reference or starting level.
7. The *FREQ* display will indicate the receive frequency in hertz. CAUTION: If the Send Function selector switch is in *SWEEP FAST* or *SWEEP SLOW*, the *FREQ* display will indicate the output generator's frequency rather than the receive frequency

Send Generator

This section describes the procedures for setting up the Model 210 generator.

SEND LEVEL AND FREQUENCY SET-UP

To set up the *SEND GENERATOR*, proceed as follows:

1. Perform the required steps in the *LINE INTERFACE* section.
2. Set the desired send level in dBm using the thumb wheel switch labeled *SEND LEVEL*.
3. Set the Send Function selector switch to one of the four fixed frequencies (404, 1004, 2804 or 2713 Hz), the *VAR* position or one of the two sweep positions.
   a. If the *VAR* position is chosen, use the *SEND FREQ* thumb wheel switches to set the desired frequency in 10Hz steps from 204Hz (0.20) to 4994Hz (4.99)
   b. In the *SWEEP FAST* or *SWEEP SLOW* positions, the Test Set will sweep initially from below 104Hz to 4004Hz in 100Hz steps and then sweep continuously from 204Hz to 4004Hz in 100Hz steps. The Test Set will automatically skip over the S.F. frequencies of 2604Hz and 2704Hz. In the *SWEEP FAST* position the Test Set will step to a new frequency every 4 seconds and in the *SWEEP SLOW* position, once every 8 seconds. When either of the sweep functions are used, the send frequency of the generator will be displayed in the *FREQ* display.

QUIET TERMINATION

To place a quiet termination on the send output, proceed as follows:

1. Perform the required steps in the *LINE INTERFACE* section.
2. Set the Send Function selector switch to the *QUIET TERM* position.

Battery Information Charging

The 210 Test Set is powered with rechargeable nickel-cadmium batteries. When the batteries are fully charged, the Test Set will operate for in excess of 8 hours under normal operating conditions. The Test Set contains circuitry for both low battery detection and automatic Test Set shut off (to avoid over discharge damage to the batteries).

When the *LOW BAT* indicator lights, the Test Set will continue to operate for approximately 45 minutes. After approximately 45 minutes of operation with the *LOW BAT* indicator lit, the Test Set will automatically turn itself off.

To recharge the Test Set batteries, insert the cable plug on the supplies battery charger into the *BAT CHG* jack on the Test Set front panel. Plug the battery charger into a 105V to 125V AC outlet. A completely discharged test set will require 16 hours of charging with the power off to regain full battery power.

Under normal operating conditions, a battery cycle life in excess of 1000 charge/discharge cycles can be expected.

Warranty

BERRY Electronics, Inc., products are warranted against defects in materials and workmanship. This warranty applies for one year following date of shipment. BERRY will repair or replace products which prove to be defective during the warranty period. NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. BERRY IS NOT LIABLE FOR CONSEQUENTIAL DAMAGES. THIS WARRANTY POLICY APPLIES ONLY TO EQUIPMENT FAILURES WHICH RESULTED DUE TO NORMAL OPERATION AND HANDLING, AND ARE NOT A RESULT OF BUYER'S NEGLECT OR MISUSE.

Repair Centers

The regional repair center available for repair and maintenance of the 210 Test Set is:

BERRY Electronics, Inc.
c/o CSE Service Center
100 W. Central, Box 308
New London, MN 56273
Telephone (800) 428-9267
In Minnesota (612) 354-2251

If a unit is being returned for service, please enclose the following information:

Type of repair or service required.
Model number and serial number.
Return address.
List of symptoms if repair is required.
Name and telephone number of person to contact concerning the repair or service.

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